Helen can paint 950 sq ft with 2 gal of paint. How many 1-gal cans does she need in order to paint a 30,000 sq ft wall?

<table>
<thead>
<tr>
<th>Set A: SQ FT of surface</th>
<th>Set B: GALLONS of paint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sq Ft</td>
<td>Gallons</td>
</tr>
<tr>
<td>Case #1</td>
<td></td>
</tr>
<tr>
<td>950</td>
<td>2</td>
</tr>
<tr>
<td>Case #2</td>
<td></td>
</tr>
<tr>
<td>30,000</td>
<td></td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE the square footage from 950 to 30,000 sq ft, is it reasonable to expect that she would have to INCREASE the number of gallons of paint?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #1.

1. FAMILARIZE.
   Set A: SQ FT of surface
   Set B: GALLONS of paint

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. TRANSLATE.

3. SOLVE.

   \[
   19g = 1,200
   \]

   \[
   \frac{19}{19} = \frac{1,200}{19}
   \]

   \[
   g = 63.1578
   \]

4. CHECK.

   \[
   \frac{19}{600} = \frac{2}{63.1578}
   \]

   \[
   19 \times 63.1578 = 1,199.9998
   \]

5. STATE.

   At this rate, Helen would have to buy 64 gallons of paint.

   NOTE: Even though the answer is closer to 63 gallons, 64 gallons would be needed.
A mathematics instructor asserted that students’ test grades are directly proportional to the amount of time spent studying. Brent studies 15 hr for a particular test and gets a score of 85. At this rate, what score would he have received if he had studied 16 hr?

Set A: TIME of study
Set B: SCORE on test

<table>
<thead>
<tr>
<th>Study Time</th>
<th>Test Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>15</td>
</tr>
<tr>
<td>Case #2</td>
<td>16</td>
</tr>
</tbody>
</table>

When he increases from 15 hrs to 16 hrs of study time, is it reasonable to expect that he would increase his test score?

YES, so it would be DIRECT proportion.
Question #2.

1. **FAMILARIZE.**
   - Set A: TIME of study
   - Set B: SCORE on test
   
   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**
   
   \[
   15s = 1360 \\
   s = \frac{1360}{15} = \frac{1360}{15} = 90 \frac{2}{3} \text{ or } 91
   \]

4. **CHECK.**
   
   \[
   \frac{15}{16} = \frac{85}{90 \frac{2}{3}} \quad \text{and} \quad 15 \times 90 \frac{2}{3} = 1360
   \]

5. **STATE.**
   
   If Brent increases his study time from 15 hrs to 16 hrs, he can expect a score of 90 \(\frac{2}{3}\) or 91.
3. A 21-inch diameter pulley, revolving at 65 rpm, turns a smaller pulley at 210 rpm. What is the diameter of the smaller pulley?

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Case #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpm</td>
<td>diameter</td>
</tr>
<tr>
<td>65</td>
<td>21</td>
</tr>
<tr>
<td>210</td>
<td>d</td>
</tr>
</tbody>
</table>

Set A: RPM of pulleys  
Set B: DIAMETERS of pulleys

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 65 rpm to 210 rpm, what would you reasonably expect the diameter to be?  
*An INCREASE?*  

NO, to increase the rpm, you must shorten the length of the diameter of the pulley.  
Therefore, this an INDIRECT PROPORTION.
Your test item should look like this:

Question #3.

1. **FAMILARIZE.**
   - Set A: RPM
   - Set B: DIAMETER

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**
   
   \[
   \frac{65}{210} = \frac{d}{21} \quad \Rightarrow \quad \frac{65}{210} \times 42 = \frac{d}{21} \\
   42d = 13 \times 21 \\
   42d = 273
   \]

4. **CHECK.**
   
   \[
   \frac{13}{42} = \frac{6.5}{21} \quad \Rightarrow \quad 13 \times 21 = 273 \\
   42 \times 6.5 = 273
   \]

5. **STATE.**

The diameter of the smaller pulley would have to be 6.5 or 6 1/2 inches.
Rice Krispies® Cereal. The nutritional chart on the side of a box of Kellogg’s Rice Krispies® Cereal states that there are **120 calories** in a **1 1/4 cup** serving. How many **calories** are there in **5 cups** of the cereal?

<table>
<thead>
<tr>
<th>Set A: SERVINGS in cups</th>
<th>Set B: CALORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Servings</strong></td>
<td><strong>Calories</strong></td>
</tr>
<tr>
<td>Case #1</td>
<td>Case #2</td>
</tr>
<tr>
<td>1 1/4</td>
<td>120</td>
</tr>
<tr>
<td>5</td>
<td><strong>c</strong></td>
</tr>
</tbody>
</table>

Determine if it **DIRECT** or **INDIRECT** proportion.

When you **INCREASE** from 1 1/4 cups to 5 cups, is it reasonable to expect that the number of calories would **INCREASE**?

**YES, so it would be DIRECT proportion.**
1. **FAMILARIZE.**

   Set A: SERVINGS in cups
   Set B: CALORIES

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Case #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4</td>
<td>5</td>
</tr>
<tr>
<td>120</td>
<td>c</td>
</tr>
</tbody>
</table>

2. **TRANSLATE.**

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

3. **SOLVE.**

   \[
   \begin{align*}
   1 \frac{1}{4} c & = 600 \\
   1 \frac{1}{4} c & = 600 \\
   \frac{1 \frac{1}{4} c}{1 \frac{1}{4}} & = \frac{600}{1 \frac{1}{4}} \\
   c & = 600 \div 1 \frac{1}{4} = 480
   \end{align*}
   \]

4. **CHECK.**

   \[
   \begin{align*}
   1 \frac{1}{4} & = 120 \\
   5 & = 480 \\
   5 \times 120 & = 600 \\
   1 \frac{1}{4} \times 480 & = 600
   \end{align*}
   \]

5. **STATE.**

   If 1 1/4 cups of this cereal contains 120 calories, then 5 cups should contain 480 calories.
A farmer has enough feed to feed 64 cows for 2 days. How long would the same food last 16 cows?

Set A: NUMBER of COWS  
Set B: NUMBER of DAYS

<table>
<thead>
<tr>
<th>Cows</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>d</td>
</tr>
</tbody>
</table>

If you decrease the number of cows, the number of days would increase. Thus, this is an INDIRECT proportion.

Determine if it DIRECT or INDIRECT proportion.

When you decrease the number of cows from 64 to 16, what would you expect to happen to the number of days that the food would last? INCREASE or DECREASE?
Your test item should look like this:

Question #5.

1. **FAMILARIZE.**
   
   Set A: Number of COWS
   
   Set B: Number of DAYS

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Case #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COWS</td>
<td>DAYS</td>
</tr>
<tr>
<td>64</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>d</td>
</tr>
</tbody>
</table>

2. **TRANSLATE.**

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

3. **SOLVE.**

   \[
   \frac{64}{16} = \frac{d}{2} \rightarrow \frac{64}{16} \cdot \frac{4}{1} = \frac{d}{2}
   \]

   \[
   1 \cdot d = 4 \cdot 2
   \]

   \[
   d = 8
   \]

4. **CHECK.**

   \[
   \frac{4}{1} = \frac{8}{2} \quad 4 \times 2 = 8
   \]

   \[
   \frac{1}{2} = \frac{8}{8} \quad 1 \times 8 = 8
   \]

5. **STATE.**

   At the same rate of consumption, the farmer’s feed would last 16 cows for 8 days.
It is predicted that for every 1000 people in the state of Illinois, 130.9 will die of cancer. The population of Chicago is about 2,721,547. How many of these people will die of cancer?

Set A: TOTAL Illinoisans in group
Set B: Cancer Victims

<table>
<thead>
<tr>
<th>Case #1</th>
<th>TOTAL IL</th>
<th>Cancer Vic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>130.9</td>
<td></td>
</tr>
<tr>
<td>Case #2</td>
<td>2,721,547</td>
<td>c</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you increase your base from 1000 Illinoisans to 2,721,547 citizens, is it reasonable to expect the number of cancer victims to INCREASE?

YES, so it would be DIRECT proportion.
Your test item should look like this:

**Question #6.**

1. **FAMILARIZE.**
   - Set A: TOTAL Illinoisans
   - Set B: Cancer victims
   - Case #1
     - TOT IL: 1000
     - Cancer vic: 130.9
   - Case #2
     - TOT IL: 2,721,547
     - Cancer vic: c

2. **TRANSLATE.**

3. **SOLVE.**
   - \[
   \frac{1000}{2,721,547} = \frac{c}{130.9}
   \]
   - \[
   1000c = 2,721,547 \times 130.9
   \]
   - \[
   1000c = 356,250,502.3
   \]

4. **CHECK.**
   - \[
   \frac{1000}{2,721,547} = \frac{356,250.5}{130}
   \]
   - \[
   1000 \times 356,250.5 = 356,250,500
   \]
   - \[
   2,721,547 \times 130.9 = 356,250,502.3
   \]

5. **STATE.**
   - At this rate, approximately 356,251 citizens of Chicago will die of cancer.
On a map, \( \frac{1}{4} \) inch represents 50 miles. If two cities are 3 1/4 inches apart on the map, how far apart are they in reality?

Set A: Distance on map  
Set B: Distance in reality

<table>
<thead>
<tr>
<th>MAP distance</th>
<th>REAL distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>50</td>
</tr>
<tr>
<td>3 1/4</td>
<td>d</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

If you increase the distance on the map from 1/4 to 3 1/4 inches, is it reasonable to expect that real distance would increase?

YES, so it would be DIRECT proportion.
Question #7.

1. FAMILIARIZE.

Set A: MAP distance  
Set B: REAL distance

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A₁</td>
<td>B₁</td>
</tr>
</tbody>
</table>

2. TRANSLATE.

MAP distance | REAL distance
---|---

<table>
<thead>
<tr>
<th>Case</th>
<th>1/4</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>3 1/4</td>
<td>d</td>
</tr>
</tbody>
</table>

3. SOLVE.

\[
\frac{1}{4} \cdot d = 162 \frac{1}{2} \\
\frac{1}{4} \cdot d = 162 \frac{1}{2} = \frac{162}{4} \cdot \frac{2}{2} \\
d = 162 \frac{1}{2} \div \frac{1}{4} = \frac{325}{2} \div \frac{1}{4}
\]

\[
d = \frac{325}{2} \cdot 4 \div 1 = 650
\]

4. CHECK.

\[
\frac{1}{4} = \frac{50}{650} \\
\frac{3 \frac{1}{4}} = \frac{162 \frac{1}{2}}{650}
\]

\[
\frac{1}{4} \times 650 = 162 \frac{1}{2} \\
3 \frac{1}{4} \times 50 = 162 \frac{1}{2}
\]

5. STATE.

The cities are actually 650 miles apart.
Roy bicycled 234 mi in 14 days. At this rate, how far would Roy travel in 42 days?

Set A: Days

<table>
<thead>
<tr>
<th>Days</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>234</td>
</tr>
<tr>
<td>42</td>
<td>d</td>
</tr>
</tbody>
</table>

Set B: Distance in miles

Determine if it DIRECT or INDIRECT proportion.

If you increase the days one travels from 14 to 42 days, is it reasonable to expect that one would travel further?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #8.

1. FAMILIARIZE.
   Set A: Days
   Set B: Miles Traveled
   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. TRANSLATE.

3. SOLVE.
   \[g = 3 \cdot 234\]
   \[g = 702\]

4. CHECK.
   \[\frac{1}{3} = \frac{234}{702}\]
   \[1 \times 702 = 702\]
   \[3 \times 234 = 702\]

5. STATE.
   At the same rate, Roy can expect to travel 702 miles in 42 days.
It takes **96 hours** for **3 strawberry pickers** to clear a field. How many **hours** would it take **48 pickers**?

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Pickers</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Case #2</td>
<td>48</td>
<td><strong>h</strong></td>
</tr>
</tbody>
</table>

**Set A**: NUMBER of pickers  
**Set B**: Hours to complete job

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE the number of pickers from 3 to 48, is it reasonable to expect that the number of hours to clear the field would INCREASE or DECREASE?

The number of hours to clear the field should decrease. Thus, this is an INDIRECT PROPORTION.
Your test item should look like this:

Question #9.

1. FAMILARIZE.
   Set A: NUMBER of pickers
   Set B: NUMBER of hrs to clear field

2. TRANSLATE.

3. SOLVE.
   \[
   \frac{3}{48} = \frac{h}{96} \quad \Rightarrow \quad \frac{3}{16} = \frac{1}{h}
   \]
   \[
   16 h = 96
   \]
   \[
   h = 6
   \]

4. CHECK.
   \[
   \frac{1}{16} = \frac{6}{96} \quad \Rightarrow \quad 1 x 96 = 96
   \]
   \[
   16 x 6 = 96
   \]

5. STATE.

It would take 48 strawberry pickers 6 hours to clear the field.
A professor must grade 32 essays in a literature class. She can grade 5 essays in 40 min. At this rate, how long will it take her to grade all 32 essays?

Set A: Essays
Set B: Time in min

<table>
<thead>
<tr>
<th>Essays</th>
<th>Time in min</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>32</td>
<td>m</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 5 to 32 essays to grade, is it reasonable to expect that the number of minutes would INCREASE?

YES, so it would be DIRECT proportion.
Your test item should look like this:

### Question #10.

1. **FAMILARIZE.**
   - Set A: Essays
   - Set B: Time in min

<table>
<thead>
<tr>
<th>Essays</th>
<th>Time in min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>5</td>
</tr>
<tr>
<td>Case #2</td>
<td>32</td>
</tr>
</tbody>
</table>

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   \frac{5\times m}{5} = \frac{1280}{5}
   \]

   \[
   m = 256 \text{ minutes}
   \]

4. **CHECK.**

   \[
   \frac{5}{32} = \frac{40}{256}
   \]

   \[
   5 \times 256 = 1280
   \]

5. **STATE.**

   At the same rate, it will take her 256 minutes or 4 hr 16 min to grade all 32 essays.
If a school kitchen has enough food for 255 pupils for 35 days, how many days would the same food last 119 pupils?

Set A: NUMBER of pupils  Set B: NUMBER of days

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Pupils</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>255</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Case #2</td>
<td>119</td>
<td>d</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you DECREASE from 255 to 119 pupils, is it reasonable to expect that the number of days that the food would last would INCREASE or DECREASE?

It is reasonable to expect the food last MORE days. Thus this is an INDIRECT proportion.
Your test item should look like this:

Question #11.

1. FAMILARIZE.
   Set A: Pupils
   Set B: Days

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. TRANSLATE.

3. SOLVE.
   \[
   119 \cdot d = 8925
   \]
   \[
   \frac{119}{119} = \frac{8925}{119}
   \]
   \[
   d = 75
   \]

4. CHECK.
   \[
   \frac{255}{119} = \frac{75}{35}
   \]
   \[
   255 \times 35 = 8925
   \]
   \[
   119 \times 75 = 8925
   \]

5. STATE.

   The same amount of food would last 119 students for 75 days.
Bonnie can waterproof 450 sq ft of decking with 2 gal of sealant. How many gallons should Bonnie buy for a 1200 sq ft deck?

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Sq ft</th>
<th>gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case #2</th>
<th>Sq ft</th>
<th>gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td></td>
<td>g</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 450 to 1200 sq ft, is it reasonable to expect that one will need more paint?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #12.

1. **FAMILIARIZE.**
   - Set A: sq ft
   - Set B: gallons
   
   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**
   
   \[
   \frac{450}{1200} = \frac{2}{g}
   \]
   
   \[
   3g = 8 \cdot 2
   \]
   
   \[
   3s = 16
   \]

3. **SOLVE.**
   
   \[
   3g = 16
   \]
   
   \[
   \frac{3g}{3} = \frac{16}{3}
   \]
   
   \[
   g = 5 \frac{1}{3} \text{ gal or 6 gal}
   \]

4. **CHECK.**
   
   \[
   \frac{3}{8} = \frac{2}{5 \frac{1}{3}}
   \]
   
   \[
   2 \times 8 = 16
   \]
   
   \[
   3 \times 5 \frac{1}{3} = 16
   \]

5. **STATE.**
   
   For a 1200 sq ft of deck, Bonnie will need 5 1/3 or 6 gallons of paint.

**Footnote:** Why did the answer get rounded UP to 6 gallons when 5 1/3 is closer to 5? Because in reality, you have to buy the sixth gallon so that you could use 1/3 of it!
If **15 electricians** can wire some new house in **22 days**, how many **electricians** would be required to do the job in **10 days**?

Set A: DAYS to complete  
Set B: NUMBER of electricians

<table>
<thead>
<tr>
<th>DAYS</th>
<th>ELECTRICIANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>22</td>
</tr>
<tr>
<td>Case #2</td>
<td>10</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you DECREASE from 22 to 10 days to complete the job, is it reasonable to expect the number of electricians to INCREASE or DECREASE?

To do the job in LESS time, you would need MORE electricians. Thus, this is an INDIRECT PROPORTION.
Your test item should look like this:

Question #13.

1. **FAMILARIZE.**
   
   Set A: Days to complete
   
   Set B: Numbers of electricians

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   5e = 165
   \]

4. **CHECK.**

   \[
   \frac{11}{5} = \frac{33}{15} \quad 11 \times 15 = 75
   \]

5. **STATE.**

   To complete the job in 10 days, it would require 33 electricians.
An 8-lb turkey breast contains 36 servings of meat. How many pounds of turkey breast would be needed for 54 servings?

Set A: servings

<table>
<thead>
<tr>
<th>Servings</th>
<th>Lbs of turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>36</td>
</tr>
<tr>
<td>Case #2</td>
<td>54</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 36 to 54 servings, is it reasonable to expect the number of pounds of turkey will increase?

YES, so it would be DIRECT proportion.
Question #14.

1. **FAMILARIZE.**
   
   Set A: servings
   Set B: lbs of turkey
   
   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   \frac{36}{54} = \frac{8}{p}
   \]
   
   \[
   2p = 3 \times 8
   \]
   
   \[
   2p = 24
   \]

4. **CHECK.**

   \[
   \frac{2}{3} = \frac{8}{12}
   \]
   
   \[
   2 \times 12 = 24
   \]

5. **STATE.**

   Twelve pounds of turkey will be needed to make 54 servings.
A car traveling at 45 mph takes 33 minutes to complete a journey. How long does a car traveling at 55 mph take to complete the same journey?

Set A: miles per hour

<table>
<thead>
<tr>
<th>mph</th>
<th>minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>33</td>
</tr>
<tr>
<td>55</td>
<td>m</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 45 to 55 mpg, is it reasonable to expect it to take more or less time to complete the journey?

At the faster rate of speed, it would take less time to complete the journey. Thus, this is an INDIRECT PROPORTION.
Question #15.

1. **FAMILARIZE.**
   - Set A: mph
   - Set B: minutes
   
   
   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   11 \ t = 297
   \]

   \[
   \frac{11 \ t}{11} = \frac{297}{11}
   \]

   \[
   t = 27
   \]

4. **CHECK.**

   \[
   \frac{9}{11} = \frac{27}{33}
   \]

   \[
   9 \times 33 = 297
   \]

   \[
   \frac{11 \times 27}{11 \times 33} = \frac{297}{297}
   \]

5. **STATE.**

   At 55 mph, it would take 27 minutes to complete the journey.
On 26 April 2005, 1 U.S. dollar was worth about 1.1894 Swiss francs.

a) How much would 360 U.S. dollars be worth in Swiss francs?
b) How much would a pair of jeans cost in U.S. dollars that costs 80 Swiss francs?

Part a of the problem.

Set A: US dollars
Set B: Swiss francs

<table>
<thead>
<tr>
<th>US $</th>
<th>Swiss francs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.1894</td>
</tr>
<tr>
<td>360</td>
<td>S</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 1 to 360 US dollars, is it reasonable to expect the number of Swiss francs will increase?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #16 a.

1. **FAMILIARIZE.**
   
   Set A: US dollars
   
   Set B: Swiss francs
   
   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   S = 360 \cdot 1.1894
   \]

   \[
   S = 428.184
   \]

4. **CHECK.**

   \[
   \frac{1}{360} = \frac{1.1894}{428.184}
   \]

5. **STATE.**

   Three hundred sixty US dollars would convert to 428.184 Swiss francs.
On 26 April 2005, 1 U.S. dollar was worth about 1.1894 Swiss francs.

a) How much would 360 U.S. dollars be worth in Swiss francs?
b) How much would a pair of jeans cost in U.S. dollars that costs 80 Swiss francs?

Part b of the problem:

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Case #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swiss francs</td>
<td>US $</td>
</tr>
<tr>
<td>1.1894</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>d</td>
</tr>
</tbody>
</table>

Set A: Swiss francs  Set B: US dollars

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 1.1894 to 80 Swiss francs, is it reasonable to expect the number of US dollars will increase? YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #16 b.

1. **FAMILARIZE.**
   
   Set A: Swiss francs
   Set B: US dollars

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   1.1894 \times d = 80
   \]

   \[
   \frac{1.1894}{80} = \frac{1}{d}
   \]

   \[
   1.1894 \times d = 80
   \]

   \[
   d = 67.2608 \text{ or } \$67.26
   \]

4. **CHECK.**

   \[
   \frac{1.1894}{80} = \frac{1}{67.26}
   \]

   \[
   1 \times 80 = 80
   \]

   \[
   1.1894 \times 67.26 = 79.999 \text{ or } 80
   \]

5. **STATE.**

   The pair of jeans would cost \$67.26 US dollars.
I can afford 17 bars of chocolate at $ .95 per bar. How many bars at $ .85 per bar can I buy with the same money?

Set A: COST of bars

<table>
<thead>
<tr>
<th>COST</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ .95</td>
<td>17</td>
</tr>
</tbody>
</table>

Set B: NUMBER of bars

<table>
<thead>
<tr>
<th>CASE #1</th>
<th>CASE #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ .85</td>
<td>n</td>
</tr>
</tbody>
</table>

If the chocolate bars cost LESS, then one could buy MORE bars. Thus, this is an INDIRECT PROPORTION.

Determine if it DIRECT or INDIRECT proportion.

When you DECREASE from $ .95 to $ .85 per bar, is it reasonable to expect the number of bars will increase or decrease?
Your test item should look like this:

1. **FAMILARIZE.**
   - Set A: COST of bars
   - Set B: NUMBER of bars

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**
   - \(.17n = 3.23\)
   - \(\frac{.17n}{.17} = \frac{3.23}{.17}\)
   - \(n = 19\)

4. **CHECK.**
   - \(.19 = \frac{19}{17}\)
   - \(.17 \times 17 = 3.23\)

5. **STATE.**
   - At the reduced price, you could purchase 19 chocolate bars.
On 26 April 2005, 1 U.S. dollar was worth about 11.059 Mexican pesos.

a) How much would 120 U.S. dollars be worth in Mexican pesos?

b) Jackie was traveling in Mexico and bought a watch that cost 3600 Mexican pesos. How much would it cost in U.S. dollars?

Part a of the problem.

Set A: US dollars

<table>
<thead>
<tr>
<th>Case #1</th>
<th>US $</th>
<th>Mexican pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.059</td>
<td></td>
</tr>
</tbody>
</table>

Set B: Mexican pesos

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 1 to 120 US dollars, is it reasonable to expect the number of Mexican pesos will increase?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #18 a.

1. FAMILARIZE.
   Set A: US dollars
   Set B: Mexican pesos

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. TRANSLATE.

3. SOLVE.
   \[p = 120 \cdot 11.059\]
   
   \[p = 1327.08\]

4. CHECK.
   \[\frac{1}{120} = \frac{11.059}{1327.08}\]

5. STATE.
   One hundred twenty US dollars would convert to 1327.08 Mexican pesos.
On 26 April 2005, 1 U.S. dollar was worth about 11.059 Mexican pesos.

a) How much would 120 U.S. dollars be worth in Mexican pesos?
b) Jackie was traveling in Mexico and bought a watch that cost 3600 Mexican pesos. How much would it cost in U.S. dollars?

Part b of the problem.

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Mexican pesos</th>
<th>US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.059</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Set A: Mexican pesos  
Set B: US dollars

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 11.059 to 3600 Mexican pesos, is it reasonable to expect the number of US dollars will increase?

YES, so it would be DIRECT proportion.
Question #18 b.

1. **FAMILARIZE.**
   - Set A: Mexican pesos
   - Set B: US dollars

\[ \frac{A}{A_1} = \frac{B}{B_1} \]

2. **TRANSLATE.**

\[ \frac{11.059}{A_1} = \frac{3600}{B_1} \]

\[ \frac{11.059}{3600} = \frac{1}{d} \]

3. **SOLVE.**

\[ 11.059 \cdot d = 3600 \]

\[ \frac{11.059}{11.059} = \frac{3600}{3600} \]

\[ d = 325.526 \text{ or } \$ 325.53 \]

4. **CHECK.**

\[ \frac{11.059}{3600} = \frac{1}{325.53} \]

\[ 1 \times 3600 = 3600 \]

\[ 11.059 \times 325.53 = 3600.03 \text{ or } 3600 \]

5. **STATE.**

Jackie’s watch would cost $325.53 US dollars.
Ten workers take **14 days** to deliver census forms to all houses in a particular city. How many **workers** could do it **20 days**?

Set A: Number of DAYS

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Days</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Set B: Number of WORKERS

<table>
<thead>
<tr>
<th>Case #2</th>
<th>Days</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>w</td>
<td></td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

If you increase the number of days to deliver from 14 to 20, is it reasonable to expect that one would need more or less workers?

You would need LESS workers to deliver the census forms in MORE days. Thus, this is an INDIRECT PROPORTION.
Your test item should look like this:

Question #19.

1. **FAMILIARIZE.**
   
   Set A: DAYS to deliver
   Set B: NUMBER of workers

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**
   
   \[10w = 70\]
   
   \[
   \frac{10w}{10} = \frac{70}{10}
   \]
   
   \[w = 7\]

4. **CHECK.**
   
   \[
   \frac{7}{10} = \frac{7}{10}
   \]
   
   \[7 \times 10 = 70\]

   \[
   \frac{14}{20} = \frac{w}{10}
   \]
   
   \[\frac{14}{20} \cdot \frac{10}{10} = \frac{14 \cdot 7}{10} = \frac{w}{10}\]

5. **STATE.**

   It would only take 7 workers to deliver the census forms in 20 days.
A 2005 Volkswagen Passat will go 462 mi on 16.5 gal of gasoline in highway driving.

a) How many gallons of gasoline will it take to drive 1650 mi from Pittsburgh to Albuquerque?

b) How far can the car be driven on 130 gal of gasoline?

Part a of the problem.

Set A: Distance in miles

<table>
<thead>
<tr>
<th>Miles</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>462</td>
</tr>
<tr>
<td>Case #2</td>
<td>1650</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

If you increase the miles one travels from 462 to 1650 miles, is it reasonable to expect that one would need more gasoline?
Your test item should look like this:

**Question #20 a.**

1. **FAMILARIZE.**
   - Set A: Miles Traveled
   - Set B: Gallons of gas

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Case #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>462</td>
<td></td>
</tr>
<tr>
<td>16.5</td>
<td>g</td>
</tr>
</tbody>
</table>

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   \frac{462}{1650} = \frac{16.5}{g} \rightarrow \frac{7}{25} = \frac{16.5}{g}
   \]

   \[
   7g = 25 \times 16.5
   \]

   \[
   7g = 412.5
   \]

4. **CHECK.**

   \[
   \frac{7}{25} = \frac{16.5}{58.9}
   \]

5. **STATE.**

   At the same rate of gas consumption, it should take approximately 59 gallons of gas to travel 1650 miles.

   \[
   25 \times 16.5 = 412.5
   \]

   \[
   7 \times 58.928 = 412.496 \quad \text{(rounding error)}
   \]
A 2005 Volkswagen Passat will go [462 mi](#) on [16.5 gal](#) of gasoline in highway driving.

a) How many gallons of gasoline will it take to drive [1650 mi](#) from Pittsburgh to Albuquerque?

b) How far can the car be driven on [130 gal](#) of gasoline?

### Set A: Gallons of gas

<table>
<thead>
<tr>
<th>Gallons</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.5</td>
<td>462</td>
</tr>
<tr>
<td>130</td>
<td><a href="#">g</a></td>
</tr>
</tbody>
</table>

**Case #1**

**Case #2**

Determine if it DIRECT or INDIRECT proportion.

If you increase the gallons used from 16.5 to 130, is it reasonable to expect that one would be able to travel more miles?
Your test item should look like this:

Question #20 b.

1. **FAMILARIZE.**

   - **Set A:** Gallons of gas
   - **Set B:** Distance traveled in miles

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

   \[
   \frac{16.5}{130} = \frac{462}{m}
   \]

   \[
   3.3m = 26 \times 462
   \]

   \[
   3.3m = 12,012
   \]

3. **SOLVE.**

   \[
   3.3 \, \text{m} = 12,012
   \]

   \[
   \frac{3.3}{3.3} = \frac{12,012}{3.3}
   \]

   \[
   m = 12,012 \div 3.3 = 3640
   \]

4. **CHECK.**

   \[
   \frac{3.3}{26} = \frac{462}{3640}
   \]

   \[
   3.3 \times 3640 = 12,012
   \]

   \[
   26 \times 462 = 12,012
   \]

5. **STATE.**

   At the same rate of gas consumption, one should be able to drive 3640 miles on 130 gallons of gas.
A large gear with 180 teeth running at 600 rpm turns a small gear turning at 900 rpm. How many teeth does the small gear have?

**Set A:** rpm  
**Set B:** number of teeth

<table>
<thead>
<tr>
<th>Case #1</th>
<th>600</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #2</td>
<td>900</td>
<td>g</td>
</tr>
</tbody>
</table>

To INCREASE the speed of two gears in mesh, you would have to DECREASE the number of teeth. Thus, this is an INDIRECT PROPORTION.

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 600 to 900 rpm, is it reasonable to expect the number of teeth to increase or decrease?
Your test item should look like this:

Question #21.

1. FAMILIARIZE.

Set A: rpm
Set B: number of teeth

\[
\frac{A}{A_1} = \frac{B_1}{B}
\]

2. TRANSLATE.

3. SOLVE.

\[
\frac{600}{900} = \frac{t}{180}
\]

\[
3t = 2 \cdot 180
\]

\[
3t = 360
\]

4. CHECK.

\[
\frac{2}{3} = \frac{120}{180}
\]

\[
2 \times 180 = 360
\]

\[
\frac{600}{900} = \frac{2}{t}
\]

\[
\frac{600}{900} \cdot 3 = \frac{t}{180}
\]

5. STATE.

To increase the speed to 900 rpm, you have to use a gear with a 120 teeth.
When 38 gal of maple sap are boiled down, the result is 2 gal of maple syrup. How much sap is needed to produce 9 gal of syrup?

Set A: gallons of syrup  
Set B: gallons of maple sap

<table>
<thead>
<tr>
<th>Gallons of syrup</th>
<th>Gallons of sap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>2</td>
</tr>
<tr>
<td>Case #2</td>
<td>9</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE from 2 to 9 gallons of syrup, is it reasonable to expect that you would need more sap?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #22.

1. **FAMILARIZE.**
   - Set A: gallons of syrup
   - Set B: gallons of sap

   \[
   \frac{A}{A_1} = \frac{B}{B_1}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   \begin{align*}
   2g &= 342 \\
   \frac{2g}{2} &= \frac{342}{2} \\
   c &= 171
   \end{align*}
   \]

4. **CHECK.**

   \[
   \begin{align*}
   \frac{2}{9} &= \frac{38}{171} \\
   2 \times 171 &= 342 \\
   9 \times 38 &= 342
   \end{align*}
   \]

5. **STATE.**

   At that rate, you would need 171 gallons of sap to produce 9 gallon of maple syrup.
Two pulleys are connected by a belt. A pulley having a diameter of 25 cm is turning at 900 rpm. What is the number of rpm of the second pulley, which has a diameter of 40 cm?

<table>
<thead>
<tr>
<th>Case #1</th>
<th>DIAMETER</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td></td>
<td>900</td>
</tr>
<tr>
<td>Case #2</td>
<td>40</td>
<td>r</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you INCREASE the diameter of the pulley from 25 cm to 40 cm, is it reasonable to expect that you would increase or decrease the number of rpm?
Your test item should look like this:

1. **FAMILARIZE.**

   Set A: DIAMETER of pulleys
   
   Set B: rpm of pulleys

   \[
   \frac{A}{A_1} = \frac{B_1}{B}
   \]

2. **TRANSLATE.**

3. **SOLVE.**

   \[
   8r = 4500
   
   \frac{8r}{8} = \frac{4500}{8}
   
   r = 562.5
   \]

4. **CHECK.**

   \[
   \frac{5}{8} = \frac{562.5}{900}
   
   5 \times 900 = 4500
   
   8 \times 562.5 = 45500
   \]

5. **STATE.**

   The larger gear is turning at 562.5 rpm
Coffee beans from **14 trees** are required to produce the **17 lb of coffee** that the average person in the United States drinks each year. How many **trees** are required to produce **375 lb of coffee**?

Set A: lbs of coffee.  
Set B: number of trees

<table>
<thead>
<tr>
<th>Case #1</th>
<th>Lbs</th>
<th>Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Case #2</td>
<td>375</td>
<td>t</td>
</tr>
</tbody>
</table>

**Determine if it DIRECT or INDIRECT proportion.**

When you INCREASE from 17 to 375 lbs of coffee, is it reasonable to expect that you would need more trees?

YES, so it would be DIRECT proportion.
Your test item should look like this:

Question #24.

1. FAMILARIZE.
Set A: Lbs of coffee
Set B: No. of trees

<table>
<thead>
<tr>
<th></th>
<th>Lbs</th>
<th>Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>A₁</td>
<td>375</td>
<td>t</td>
</tr>
</tbody>
</table>

2. TRANSLATE.

3. SOLVE.

\[
17t = 5250
\]

\[
\frac{17}{17} = \frac{5250}{17}
\]

\[
t = 308.82 \text{ or } 309
\]

4. CHECK.

\[
\frac{17}{375} = \frac{14}{309}
\]

\[
14 \times 375 = 5250
\]

\[
17 \times 308.82 = 5249.9 \approx 5250
\]

5. STATE.

At that rate, you will need approximately 309 trees to make 375 lbs of coffee.
In a metal alloy, the ratio of zinc to copper is \( \frac{3}{13} \). If there are 260 lb of copper, how many pounds of zinc are there?

<table>
<thead>
<tr>
<th></th>
<th>Set A: copper</th>
<th>Set B: zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case #1</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Case #2</td>
<td>260</td>
<td>( z )</td>
</tr>
</tbody>
</table>

Determine if it DIRECT or INDIRECT proportion.

When you compare 13 to 260, we can see that this is an INCREASE. Is it reasonable to expect that the lbs of zinc will be more than 3?

**YES, so it would be DIRECT proportion.**
Your test item should look like this:

1. **FAMILARIZE.**

Set A: Copper

Set B: Zinc

2. **TRANSLATE.**

\[
\frac{A}{A_1} = \frac{B}{B_1}
\]

3. **SOLVE.**

\[
z = 3 \cdot 20
\]

\[
z = 60
\]

4. **CHECK.**

\[
\frac{1}{20} = \frac{3}{60}
\]

\[
1 \times 60 = 60
\]

\[
3 \times 20 = 60
\]

5. **STATE.**

At this ratio, you will need 60 pounds of zinc.