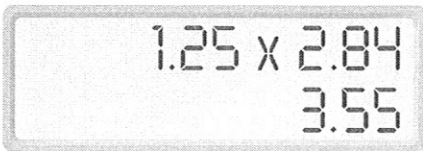b) $(-1.25)(-2.84)$

When there are more than 2 digits in both numbers being multiplied, use a calculator.
The rational numbers have the same sign, so their product is positive.
Key in 1.25 × 2.84 to display: 3.55

```
1.25 x 2.84
        3.55
```

$(-1.25)(-2.84) = 3.55$

## Discuss the ideas

1. Why does it help to predict the sign of a product before you multiply 2 rational numbers?

2. Why does it make sense that the rules for signs when you multiply integers must apply when you multiply rational numbers?

## Practice

### Check

3. Predict which products are greater than 0, then multiply to determine each product. Explain the strategy you used to predict.
   a) $3 \times (-5.2)$
   b) $2.6 \times (-4)$
   c) $(-1.3) \times 5$
   d) $(-0.9) \times (-7.1)$

4. Predict which products are less than 0, then multiply to determine each product. Explain the strategy you used to predict.
   a) $(-3) \times \frac{2}{3}$  $-2$
   b) $\left(-\frac{1}{4}\right) \times (-5)$  $1\frac{1}{4}$
   c) $\left(\frac{4}{5}\right) \times (-2)$  $-1\frac{3}{5}$
   d) $\left(-\frac{1}{2}\right) \times \frac{7}{8}$  $-\frac{7}{16}$

5. Determine each product. Estimate to place the decimal point.
   a) $(-0.64)(0.2)$  $-.128$
   b) $(-0.5)(-5.71)$  $2.855$
   c) $(-4.13)(-0.8)$  $3.304$
   d) $(0.7)(8.5)$  $5.95$

6. Which of the following expressions have the same product as $\left(-\frac{3}{4}\right)\left(\frac{5}{2}\right)$?
   Explain how you know.
   a) $\left(\frac{5}{2}\right)\left(-\frac{3}{4}\right)$
   b) $\left(\frac{3}{4}\right)\left(-\frac{5}{2}\right)$
   c) $\left(-\frac{3}{2}\right)\left(\frac{5}{4}\right)$
   d) $\left(\frac{3}{4}\right)\left(\frac{5}{2}\right)$
   e) $\left(\frac{3}{2}\right)\left(-\frac{5}{4}\right)$
   f) $\left(-\frac{3}{4}\right)\left(-\frac{5}{2}\right)$

7. Determine each product.
   a) $\left(-\frac{1}{3}\right)\left(\frac{2}{5}\right)$  $-\frac{2}{15}$
   b) $\left(\frac{1}{4}\right)\left(-\frac{3}{5}\right)$  $-\frac{3}{20}$
   c) $\left(\frac{4}{5}\right)\left(\frac{1}{2}\right)$  $\frac{2}{5}$
   d) $\left(-\frac{5}{6}\right)\left(-\frac{2}{3}\right)$  $\frac{5}{9}$

## Apply

6. At a sea port, the effect of the tide changed the water level by $-5.6$ m in 3.5 h. What was the mean change in water level per hour?



7. Determine each quotient without a calculator. Estimate to place the decimal point in the quotient.
   a) $0.32 \div 0.4$    .8
   b) $(-1.17) \div 0.8$   $-1.4625$
   c) $0.25 \div (-0.6)$   $-0.416$
   d) $(-1.02) \div (-0.2)$   5.1
   e) $3.76 \div (-0.3)$   $-12.53$
   f) $3.15 \div 0.9$   3.5

8. On a winter's day, the temperature at 6 P.M. was 0°C. Suppose the temperature decreased by 2.5°C each hour until it was $-12.5$°C. How long did it take to reach this temperature? How do you know?

9. Use a calculator to determine each quotient.
   a) $20.736 \div (-1.8)$   $-11.52$
   b) $(-27.94) \div 1.2$   $-23.283$
   c) $(-84.41) \div (-2.3)$   $36.7$
   d) $23.04 \div 4.8$   $4.8$
   e) $76.63 \div (-7.5)$   $-10.22$
   f) $(-0.1081) \div 0.45$   $-0.24$

10. **Assessment Focus** Suppose each rational number below is divided by $-0.5$. Predict which quotients are greater than $-10$. Explain the strategies you used to predict. Then evaluate only those quotients that are greater than $-10$.
    a) $-20.5$   b) 18.8   c) 10.7   d) 0.6

11. To pay for a skiing holiday in Whistler, Paige borrowed $1450.50 from her parents. She pays back $30.75 each week.
    a) How many weeks will it be until Paige is no longer in debt? Justify your answer.
    b) How did you use rational numbers to calculate the answer in part a?



12. Determine each quotient.
    a) $\frac{5}{4} \div \left(-\frac{7}{6}\right)$   $-\frac{15}{14}$
    b) $\frac{3}{10} \div \frac{12}{5}$   $\frac{1}{8}$
    c) $\left(-\frac{3}{4}\right) \div \left(-1\frac{1}{8}\right)$   $\frac{2}{3}$
    d) $\left(-4\frac{3}{5}\right) \div \frac{3}{4}$   $-6\frac{2}{15}$
    e) $3\frac{2}{3} \div \left(-2\frac{1}{4}\right)$   $-1\frac{17}{27}$
    f) $3\frac{4}{9} \div 6\frac{1}{3}$   $\frac{31}{57}$

13. A thermometer on a freezer is set at $-5.5$°C. Each time the freezer door is opened, the temperature increases by 0.3°C. Suppose there is a power outage. How many times can the door be opened before the temperature of the freezer increases to 5°C? Justify your solution.

**Discuss the ideas**

1. What does a fraction bar indicate?

2. As the number of operations increases and the expressions become more complex, it is easy to make mistakes.
   What can you do to prevent yourself making mistakes?

## Practice

### Check

3. Evaluate. Do not use a calculator.
   a) $2.3 - (-1.6) \times (0.8)$   *3.58*
   b) $(-14.8) \times 0.9 - 3.1$   *-16.42*
   c) $(-12.8) \div (-0.2) + 4.5 \div 0.5$   *73*
   d) $(-4.8) \times (-0.4 + 0.6)^2$   *-.192*

4. Evaluate. Do not use a calculator.
   a) $\frac{1}{2} + \left(-\frac{3}{4}\right) \times \frac{1}{3}$
   b) $\left(-\frac{5}{4}\right) \div \left(-\frac{1}{4} + \frac{3}{2}\right)\left(-\frac{1}{4} + \frac{3}{2}\right)$
   c) $\left(-\frac{7}{10}\right) \div \left(-\frac{2}{5}\right) - \left(-\frac{1}{4}\right) \times \frac{1}{2}$
   d) $\frac{6}{5} \times \left(-\frac{2}{3} + \frac{8}{3}\right)^2 - \frac{5}{12}$

### Apply

5. a) Use a calculator to evaluate the expression below. Key in the expression as it is written.
   $-2.8 - 1.4 \times 4.5$
   b) Does the calculator follow the order of operations or does it perform operations from left to right? How did you find out?

6. Estimate which expression has the greatest value. Then use a calculator to evaluate each expression to verify your prediction.
   a) $9.1 - 3.5 \times (4.2)^2$   *-52.64*
   b) $(9.1 - 3.5) \times (4.2)^2$   *98.78*
   c) $9.1 - (3.5 \times 4.2)^2$   *-206.99*
   d) $9.1[(-3.5) \times (4.2)^2]$   *-561.8*

7. Evaluate.
   a) $\left(-\frac{2}{3}\right) \div \frac{1}{4} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{3}$   *$-2\frac{7}{12}$*
   b) $\left(-\frac{2}{3}\right) \div \left[\frac{1}{4} + \left(-\frac{1}{2}\right)\right] \times \frac{1}{3}$   *$\frac{8}{9}$*
   c) $\left(-\frac{2}{3}\right) \div \left[\frac{1}{4} - \left(-\frac{1}{2}\right)\right] \times \frac{1}{3}$   *$-\frac{8}{27}$*
   d) $\left(-\frac{2}{3}\right) \div \left[\frac{1}{4} + \left(-\frac{1}{2}\right) \times \frac{1}{3}\right]$   *-8*

8. Find the errors in each solution. Write the correct solution.

   a) $(-3.7) \times (-2.8 + 1.5) - 4.8 \div (-1.2)$
   $= (-3.7) \times (1.3) - 4.8 \div (-1.2)$
   $= -4.81 - 4.8 \div (-1.2)$
   $= -9.61 \div (-1.2)$
   $= 8.008\overline{3}$

   b) $-\frac{3}{8} - \frac{4}{5} \times \frac{3}{10} \div \left(-\frac{4}{5}\right)$
   $= -\frac{15}{40} - \frac{32}{40} \times \frac{3}{10} \div \left(-\frac{4}{5}\right)$
   $= -\frac{47}{40} \times \frac{3}{10} \div \left(-\frac{4}{5}\right)$
   $= -\frac{141}{400} \div \left(-\frac{4}{5}\right)$
   $= -\frac{141}{400} \times \left(-\frac{5}{4}\right)$
   $= \frac{(-141) \times (-5)}{400 \times 4}$
   $= \frac{705}{1600}$

9. A family moves from Chicago to Saskatoon. A company that rents moving trucks uses this formula, $C = 1.15[21.95d + 0.035(k - 120)]$, to determine the cost, including tax, of renting a truck for $d$ days and $k$ kilometres, when $k > 120$. The distance from Chicago to Saskatoon is 2400 km and the family travels for 4 days. What is the cost to rent the truck?

10. A can of soup is a cylinder with radius 3.5 cm and height 11.5 cm.

3.5 cm

11.5 cm

CHICKEN Soup

Use the formula:
Surface area $= 2\pi r^2 + 2\pi r \times$ height,
where $r$ is the radius of the can
a) Determine the area of tin needed to make the can, to the nearest square centimetre.
b) Explain how you used the order of operations in part a.

11. a) Use this formula to convert each Fahrenheit temperature below to Celsius:
$C = \dfrac{F - 32}{1.8}$
i) 0°F    ii) −40°F    iii) −53°F

b) Here is another way to write the formula in part a: $C = \dfrac{5}{9}(F - 32)$
Use this formula to convert each Fahrenheit temperature below to Celsius:
i) 50°F    ii) −13°F    iii) 32°F
c) Which formula in parts a and b was easier to use? Explain your choice.

12. Evaluate. State the order in which you carried out the operations.
a) $\left(-4\dfrac{1}{2}\right) + \left(-\dfrac{2}{3}\right) \times 2\dfrac{3}{4}$   $-6\dfrac{1}{3}$
b) $\left(-3\dfrac{2}{5}\right) \times \left(-1\dfrac{5}{6}\right) + \dfrac{3}{10}$   $6\dfrac{8}{15}$
c) $(-3) \div \left(-\dfrac{4}{5}\right) + \left(-\dfrac{5}{12}\right) \times 1\dfrac{1}{2}$   $3\dfrac{1}{8}$
d) $\left(1\dfrac{5}{8}\right) - \left(-2\dfrac{3}{4} + 2\right)\left(-2\dfrac{3}{4} + 2\right)$   $1\dfrac{1}{16}$

13. Use a calculator to evaluate. Write the answers to the nearest hundredth where necessary.
a) $2.3 + (-11.2) \div (-0.2) - 3.7$   $54.6$
b) $(-3.4) \times 0.7 - (-1.8)(-1.8)$   $-5.62$
c) $\dfrac{0.67 - 4.2 \div (-0.2)}{(-7.3 + 8.6)^2}$   $12.82$
d) $\dfrac{8.9 \times (-3.1 + 22.7)^2 + 4.7}{(-9.6) \div 0.04 - 0.4}$   $-14.24$

14. On one day in Black Lake, Saskatchewan, the maximum temperature was −8.1°C and the minimum temperature was −16.7°C.
a) What was the mean temperature that day?
b) How did you use the order of operations in part a?