# Year 11 General Mathematics Worksheet

10 questions on Rates and Ratios from the Maths B (General Maths) national curriculum for Year 11.

Remember you can connect to one of our awesome Mathematics tutors and they'll help you understand where you're going wrong.
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**Questions**

1. The price of electricity supplied to houses changed on 11/09/2010.

Mr Khan's energy bill for the 93 days from 15/07/2010 to 15/10/2010 shows the meter reading rose from 62 909 kWh to 65 580 kWh.

| Usage | Charge |
|---|---|
| Old rate 15/07/10 to 10/09/10 – **58 days** | |
| Peak 671 kWh @ $0.1560 per kWh | $104.68 |
| Next 975 kWh @ $0.2310 per kWh | $225.23 |
| Supply charge | $13.66 |
| | |
| New rate 11/09/10 to 15/10/10 – **35 days** | |
| Peak 405 kWh @ $0.1735 per kWh | $70.27 |
| Next 620 kWh @ $0.2550 per kWh | $158.10 |
| Supply charge | $9.41 |
| | |
| GST | $558.14 |
| Total usage and supply charges | $639.49 |

How would the total charge (without GST) for the first 58 days be calculated?
NOTE: The unit for electrical power is a kilowatt hour abbreviated to kWh.

a) $(671 x 0.1560 + 975 x 0.2310 + 13.66)

b) $(671 ÷ 0.1560 + 975 ÷ 0.2310 + 13.66)

c) (671 + 975) kWh

d) $(671 + 975) x (0.1560 + 0.2310) + $13.66

Answer: _____

2. The price of electricity supplied to houses changed on 11/09/2010.
The Table shows the details of Mr Khan's energy bill.

| Usage | Charge |
|---|---|
| Old rate 15/07/10 to 10/09/10 – 58 days | |
| Peak 671 kWh @ $0.1560 per kWh | $104.68 |
| Next 975 kWh @ $0.2310 per kWh | $225.23 |
| Supply charge | $13.66 |
| | |
| New rate **11/09/10** to 15/10/10 – 35 days | |
| Peak 405 kWh @ $0.1735 per kWh | $70.27 |
| Next 620 kWh @ $0.2550 per kWh | $158.10 |
| Supply charge | $9.41 |
| | |
| GST | $558.14 |
| Total usage and supply charges | $639.49 |

By what percentage did the peak rate for electricity increase on 11/09/10?

a) $\frac{0.1735 + 0.1560}{0.1735} \times \frac{100}{1}\ \%$

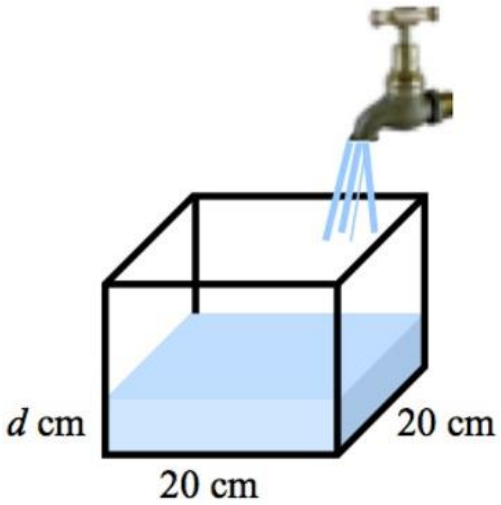
b) $\frac{0.2310 - 0.1560}{0.2310} \times \frac{100}{1}\ \%$

c) $\frac{0.1560}{0.2550} \times \frac{100}{1}\ \%$

d) $\frac{0.1735 - 0.1560}{0.1560} \times \frac{100}{1}\ \%$

Answer: _____

3. A container in the shape of a square prism with base edge 20 cm is being filled with water from a tap at the rate of 6 litres per minute.
At what rate, in cm per second, is the depth, *d* cm, of water in the container increasing?




a) 0.25 cm/sec

b) 15 cm/sec

c) 1.5 cm/sec

d) 2.5 cm/sec

Answer:_____

4. Mike bought a house for $280 000 in January 2001 and sold it for $756 000 in January 2011.
What was Mike's average profit per year on the purchase price?

a)170%

b) 4.76%

c)17%

d) 47.6%

Answer: _____

5. An online loan calculator gives the following information for borrowing money for a new car and for borrowing money for home improvements.



Which loan has the higher interest rate and why?

a) The home improvement loan because home improvements cost more than cars.

b) The home improvement loan because the car can be repossessed.

c) The car loan because the home improvement loan has higher repayments.

d) The car loan because the car might be damaged in an accident.

Answer: _____

6. 


A loan company charges 13.49% pa interest for loans for new cars.

What are the daily and weekly interest rates?

a) 0.37% and 0.519%

b) 0.37% and 2.59%

c) 0.037% and 0.519%

d) 0.037% and 0.259%

Answer: _____

7. Vivienne invests $2000 at a fixed interest rate of 6.75% pa, calculated yearly. If her interest is paid each year into the same investment account, how much will her investment be worth

(i) at the end of the first year?
(ii) at the end of the tenth year?

a) (i) $2135.00, (ii) $3843.34

b) i) $2675.00, (ii) $3843.34

c) (i) $2675.00, (ii) $3350.00

d) (i) $2135.00, (ii) $3350.00

Answer: _____

8. Brad saved up $4000 Australian dollars for a holiday in America.

He changed his $AU 4000 to American money when the rate at the money exchange was $US 0.9738 for one Australian dollar.

He spent $US 3000 during his holiday in America.

When he came home to Australia, he changed his US money back to Australian money and got $AU 1 for $US 0.9824.

How much Australian money did Brad have left out of his $AU 4000?

a) $AU1000

b) $AU3000

c) More than $AU1000

d) Less than $AU1000

Answer: _____

**9.** The following recipe ingredients make enough pumpkin scones for six people.


In cooking, one cup is the equivalent of 250 ml.

How many litres of mashed pumpkin will a baker use in making enough pumpkin scones for 96 people?

a) 8 litres

b) 4 litres

c) 32 litres.

d) 16 litres

Answer:_____

**10.**

| Richter scale no. | Typical effects of this magnitude |
|---|---|
| < 3.4 | Detected only by seismometers |
| 3.5 - 4.2 | Just about noticeable indoors |
| 4.3 - 4.8 | Most people notice them, windows rattle. |
| 4.9 - 5.4 | Everyone notices them, dishes may break, open doors swing. |
| 5.5 - 6.1 | Slight damage to buildings, plaster cracks, bricks fall. |
| 6.2 6.9 | Much damage to buildings: chimneys fall, houses move on foundations. |
| 7.0 - 7.3 | Serious damage: bridges twist, walls fracture, buildings may collapse. |
| 7.4 - 7.9 | Great damage, most buildings collapse. |
| > 8.0 | Total damage, surface waves seen, objects thrown in the air. |

In an earthquake of magnitude 6 on the Richter Scale, the ground shakes up to one metre ($10^6$ microns) sideways.

In an earthquake of magnitude N on the Richter Scale, the ground shakes up to $10^N$ microns sideways.

(A micron is one millionth of one metre.)

The largest recorded earthquake, off the coast of Chile in 1960, was of magnitude 8.9 on the Richter Scale.

In the 1960 Chile earthquake how far sideways did the seabed shake, to the nearest metre?

a) 794 metres

b) $10^{8.9}$ metres

c) $8.9 \times 10^{-6}$ metres

d) 8900 metres

Answer: _____

# The Answers.

**Hey! No peeking until you've finished…**

**Question 1**

Answer: a ) $(671 x 0.1560 + 975 x 0.2310 + 13.66)

The total cost for the first 58 days equals:
671 units of power at $0.1560 per unit + 975 units of power at $0.2310 per unit + the Supply charge of $13.66.

NOTE: The price per unit is higher if you use more electricity than 671 units.

This is to discourage consumers from wasting electricity.

**Question 2**

Answer: d ) $\frac{0.1735 - 0.1560}{0.1560} \times \frac{100}{1}\ \%$

You have to choose the correct calculation and need not complete it.
When completed, however, using a calculator
(0.1735 – 0.1560) ÷ 0.1560 = 0.1121794872
= 0.1121794872 x 100 %
= 11.2% to 1 decimal place

**Question 3**

Answer: a ) 0.25 cm/sec

Required to find at what rate, in **cm** per **second**, the depth of water in the container is increasing?
In one minute the volume of water increases by 6 L = 6000 mL.
In one second the volume of water increases by 6000 ÷ 60 mL = 100 mL.
If the height of the water in the container increases by $h$ cm to ($d$ + $h$) cm then:
20 x 20 x $h$ = 100
$h$ = 100 ÷ (20 x 20)
= 0.25 cm.

**Question 4**

Answer: c ) 17%

Increase in value = $756 000 – $280 000 = $476 000.
Number of years = 2011 – 2001 = 10
Average profit per year =$476 000 ÷ 10 = $47 600
Average percentage profit = (47 600 ÷ 280 000) × 100% = 17%

**Questions 5**

Answer: b ) The home improvement loan because the car can be repossessed.

The rate for Home Improvements of 14.49% pa is higher than the rate for a New Car of 13.49% pa.

The higher rate is because of the higher risk.

Home Improvements cannot be repossessed by the lending body, but the new car can be repossessed and has a resale value.

The lending body is risking $20 000 in the Home Improvement Loan but with the New Car it is risking only the depreciation.

**Question 6**

Answer: d ) 0.037% and 0.259%

13.49% ÷ 365 = 0.03695890411%
= 0.037% to 3 decimal places.
13.49% ÷ 52 = 0.046%
= 0.2594230769%
= 0.259% to 3 decimal places.

**Question 7**

Answer: a ) (i) $2135.00, (ii) $3843.34

(i) At the end of the first year, Vivienne has her original $2000 plus 6.75% of $2000 = $2000 x 1.0675 = $2135.
(ii) $2000 \times 1.0675^{10} = 3843.340237$

At the end of the tenth year Vivienne has \$2000 x $1.0675^{10}$ = \$3843.34

**Question 8**

Answer: d ) less than \$AU1000

\$AU 4000 = \$US 4000 x 0.9738 = \$US 3895.20
After Brad spends \$US 3000 he has \$US 895.20 left.
To change from \$US to Australian dollars, divide by the then current rate of exchange of \$AU 1 = \$US 0.9824
895.20 ÷ 0.9824 = 911.237785
Brad has \$AU 911.23 left. (Note: This would be rounded down at the money exchange).

**Question 9**

Answer: a ) 8 L

The basic recipe is for 6 people.
The baker is cooking for 96 people.
96 = 16 x 6. The baker will use 16 times the amounts in the basic recipe.
2 cups = 2 x 250 mL = 500 mL = 0.5 litres.
16 cups = 16 x 0.5 L = 8 L.
The baker will use 8 L of mashed pumpkin.

**Question 10**

Answer: a ) 794 m

In an earthquake of magnitude N on the Richter Scale, the ground shakes up to $10^N$ microns sideways.
In the Chile earthquake of magnitude 8.9 on the Richter Scale, the ground shook up to $10^{8.9}$ microns sideways.
1 micron = $10^{-6}$ metres.
$10^{8.9}$ microns = $10^{-6}$ x $10^{8.9}$metres
= $10^{2.9}$metres
= 794.3282347 metres
= 794 m to the nearest metre.