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COLLEGIATE SCHOOL

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Year 9 Number 1 Extension Booklet

Contents

1 General Arithmetic

Without a calculator, work out the following

1. i) $79 + 44 =$
   ii) $98 + 63 =$
   iii) $125 + 189 =$
   iv) $98 - 57 =$
   v) $48 - 100 =$
   vi) $61 - 88 =$

2. i) $15 \times 9 =$
   ii) $19 \times -7 =$
   iii) $-21 \times 11 =$
   iv) $-35 \times 14 =$
   v) $38 \times 24 =$
   vi) $45 \times 16 =$

3. i) $1.5 \times 2.5 =$
   ii) $1.8 \times -1.7 =$
   iii) $-2.1 \times 1.1 =$
   iv) $-3.5 \times -1.2 =$
   v) $6 \times -2.45 =$
   vi) $8 \times 9.9 =$

4. i) $456 \div 4 =$
   ii) $7\overline{)161}$
   iii) $\frac{90}{5} =$
   iv) $312 \div 8 =$
   v) $14\overline{)4914}$
   vi) $\frac{112}{7} =$

5. For these give the answer with a remainder.
   For example $28 \div 3 = 9 \ \ R\ 1$ (9 remainder 1)
   i) $100 \div 8 =$
   ii) $115 \div 3 =$
   iii) $97 \div 14 =$
   iv) $78 \div 9 =$
   v) $125 \div 6 =$
   vi) $77 \div 16 =$

2 Modular Arithmetic

2.1 Definition

When an integer A is divided by a positive integer N, it has a remainder R from the division. The value of R can be 0 and $0 \leq R < N$ (R will be greater than or equal to 0 and less than N). We can define an operation:

$$A \bmod N = R$$

Where R is the remainder when A is divided by N.

Let's look at some examples:

$5 \bmod 2 = 1$

because $5 \div 2$ has a remainder of 1

$8 \bmod 3 = 2$

because $8 \div 3$ has a remainder of 2

$39 \bmod 7 = 4$

because $39 \div 7$ has a remainder of 4

$99 \bmod 13 = 8$

because $99 \div 13$ has a remainder of 8

$26 \bmod 13 = 0$

because $26 \div 13$ has a remainder of 0

$7 \bmod 8 = 7$

because $7 \div 8$ has a remainder of 7

2.1.1 Without a calculator work out the following:

i) $16 \bmod 5 =$

ii) $19 \bmod 2 =$

iii) $11 \bmod 11 =$

iv) $38 \bmod 4 =$

v) $79 \bmod 6 =$

vi) $90 \bmod 8 =$

vii) $49 \bmod 7 =$

viii) $69 \bmod 6 =$

ix) $88 \bmod 7 =$

x) $76 \bmod 3 =$

xi) $90 \bmod 10 =$

xii) $101 \bmod 3 =$

2.2 Modulus Relationships

There are some interesting modulus relationships:

$$A \bmod N + B \bmod N = (A + B) \bmod N$$

$$A \bmod N \times B \bmod N = (A \times B) \bmod N$$

2.2.1 Exercise:

1. Make up a number of test cases and demonstrate to yourself that the above relationships are true.

2. Using what you have learned above, work out:

   i) $(16 \times 90) \bmod 5 =$

   ii) $(19 \times 89) \bmod 2 =$

   iii) $(11 \times 87) \bmod 11 =$

   iv) $(38 \times 61) \bmod 4 =$

   v) $(79 \times 5) \bmod 6 =$

   vi) $(90 \times 8) \bmod 8 =$

   vii) $(49 \times 712872818) \bmod 7 =$

   viii) $(69 \times 7) \bmod 6 =$

   ix) $(88 \times 91) \bmod 7 =$

   x) $(76 \times 2) \bmod 3 =$

   xi) $(90 \times 80) \bmod 10 =$

   xii) $(101 \times 100) \bmod 3 =$

3. Using what you have learned above answer the following questions.

   i) What is the remainder when 48×40 is divided by 13?

   ii) What is the remainder when $37 \times 41 \times 90$ is divided by 8?

   iii) A number has prime factors $2, 2, 7, 7, 11, 13$ what is the remainder when the number is divided by 3

   iv) For the same number above, what is the remainder when the number is divided by 5 ?

2.3 Divisibility Test for 3

You probably know that if we want to know if a number is divisible by 3, we can add up the digits and if this sum is divisible by 3, then the number is divisible by 3.

But **why** is this true? This section is designed to give you an idea about how we can prove that this is the case.

Complete the following:

1. $1 \bmod 3 =$
2. $10 \bmod 3 =$
3. $100 \bmod 3 =$
4. $1000 \bmod 3 =$

1. The number $492 = 4 \times 100 + 9 \times 10 + 2$
   Show that $(4 \times 100 + 9 \times 10 + 2) \bmod 3 = (4 + 9 + 2) \bmod 3$
2. How can you tell that this number is divisible by 3??
3. What is the reminder when 83674 is divided by 3 ?
4. Using a 4 digit number $PQRS$ can you **prove** that if the number is divisible by 3, then the sum of its digits is also divisible by 3?

2.4 General Questions

1. What is the unit digit for the number 123^{456}?
2. Prove that if $a^2 + b^2$ is a multiple of 3 then a and b are multiples of 3.

3 Exponents

1. In the questions below find the value for the given letters (x or y or both)

   i) $2^5 \times (1+2) = 2^x + 2^y$

   ii) $2^3 \times 2^4 = 2^x$

   iii) $(4 \times 3^4)^2 = y \times 3^x$

   iv) $32 \times 2^6 = 2^x$

   v) $(3^2 + 3^2 + 3^2 + 3^2)^2 = x \times 3^y$

   vi) $12^3 = 2^y \times 3^x$

2. Find the prime factors of $2^{302} + 2^{303}$

3. Find the prime factors of $2^{21} + 2^{17}$

4. Which pocket money system would you like (over a month only !!)?
   Explain why.

   (a) \$10 each day.

   (b) \$3 on the first day, \$3.50 on the second and increasing by 50 cents each day.

   (c) 1 cent on the first day, 2 cents on the second day, 4 cents on the third, doubling each day.

5. Which is larger $2^7 + 2^6$ or 2^8 ?

3.1 Working in base 2

Please note that $2^1 = 2$ and $2^0 = 1$ (the reason for the second of these can be explained in class).

Any number can be written as sums of powers of 2.

For example:

$$7 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$12 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$

$$18 = 1 \times 2^4 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

3.1.1 For the following, fill in the blanks and remember that they can only be 0 or 1.

i) $14 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

ii) $19 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

iii) $9 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

iv) $25 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

v) $31 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

vi) $20 = \_\_\_\_ \times 2^4 + \_\_\_\_ \times 2^3 + \_\_\_\_ \times 2^2 + \_\_\_\_ \times 2^1 + \_\_\_\_ \times 2^0$

If we just take the multiplying numbers (0,1) in order and drop any leading zeros, we can represent a number in **base 2**.
Base 2 is one of the most simple ways of representing numbers as it only uses two symbols 0 and 1. In order, they represent place values of powers of 2 (instead of powers of 10 in our decimal system).

$$7 \equiv 111 \quad (base\ 2)$$
$$\text{because } 7 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$
$$12 \equiv 1100 \quad (base\ 2)$$
$$\text{because } 12 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$
$$18 \equiv 1010 \quad (base\ 2)$$
$$\text{because } 18 = 1 \times 2^4 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

The little sign $\equiv$ means "equivalent to". So the first statement above says 7 (in base 10) is equivalent to 111 (in base 2).

Counting from 1 to 8:

$1 \equiv 1 \quad (b\ 2)$ $\quad$ $3 \equiv 11 \quad (b\ 2)$ $\quad$ $5 \equiv 101 \quad (b\ 2)$ $\quad$ $7 \equiv 111 \quad (b\ 2)$
$2 \equiv 10 \quad (b\ 2)$ $\quad$ $4 \equiv 100 \quad (b\ 2)$ $\quad$ $6 \equiv 110 \quad (b\ 2)$ $\quad$ $8 \equiv 1000 \quad (b\ 2)$

3.1.2 Complete the following

1.

i) $9 \equiv \_\_\_\_ \quad (b\ 2)$

ii) $10 \equiv \_\_\_\_ \quad (b\ 2)$

iii) $15 \equiv \_\_\_\_ \quad (b\ 2)$

iv) $24 \equiv \_\_\_\_ \quad (b\ 2)$

v) $35 \equiv \_\_\_\_ \quad (b\ 2)$

vi) $69 \equiv \_\_\_\_ \quad (b\ 2)$

2.

i) ____ $\equiv 1001 \quad (b\ 2)$
ii) ____ $\equiv 1101 \quad (b\ 2)$
iii) ____ $\equiv 1010 \quad (b\ 2)$
iv) ____ $\equiv 10000 \quad (b\ 2)$
v) ____ $\equiv 10101 \quad (b\ 2)$
vi) ____ $\equiv 11111 \quad (b\ 2)$

Let's consider introducing a decimal (or more correctly) a binary point.

What do you think 1.1 (base 2) means ? What about 1.01 (base 2)?

3.1.3 Complete the following

1.

i) ____ $\equiv 1.1 \quad (b\ 2)$
ii) ____ $\equiv 1.01 \quad (b\ 2)$
iii) ____ $\equiv 10.1 \quad (b\ 2)$
iv) ____ $\equiv 100.11 \quad (b\ 2)$
v) ____ $\equiv 11.0101 \quad (b\ 2)$
vi) ____ $\equiv 1.1111 \quad (b\ 2)$

2.

i) $1.5 \equiv$ ____ $(b\ 2)$
ii) $1.25 \equiv$ ____ $(b\ 2)$
iii) $1.75 \equiv$ ____ $(b\ 2)$
iv) $1.125 \equiv$ ____ $(b\ 2)$
v) $1.375 \equiv$ ____ $(b\ 2)$
vi) $2.625 \equiv$ ____ $(b\ 2)$

4 Rounding Numbers

1. i) Round 38 to the nearest multiple of 10
   ii) Round 47 to the nearest multiple of 6
   iii) Round 345 to the nearest multiple of 101
   iv) Round $\frac{3}{4}$ to the nearest multiple of $\frac{1}{3}$
   v) Round $\frac{3}{4}$ to the nearest multiple of $\frac{1}{9}$
   vi) Round $\frac{31}{15}$ to the nearest multiple of $\frac{1}{7}$

2. A particular computer language can add, subtract, multiply and divide numbers (+, -,*,/). It can also round any decimal or fraction to the nearest integer.
   For example $round(4.3)$=4 or $round(\frac{3}{4})$=1

   Using the information above:

   i) Write a step-by-step process for the computer to round a number N, to the nearest 10. Create a set of sensible tests to show that your process works.
   ii) Write a step by step process to round a number N to the nearest multiple of M. Create a set of sensible tests to show that your process works.

5 Ratios

Ratio

Ratio

A **ratio** is a way of dividing or splitting quantities. Although ratios can be represented as a fraction we often use a colon (:) to separate the different quantities in a ratio.

A ratio of 2 : 3 means that for every 2 units of the first quantity we use 3 units of the second quantity. Therefore if we have a ratio of 2 : 3 it is exactly the same ratio as 4 : 6 or 10 : 15.

Ratios can be simplified if we can find a common factor that divides into all the quantities.

The ratio 10 : 15 can be simplified by dividing through by the common factor of 5 giving the ratio 2 : 3.

The units for ratios should always be the same. If we are mixing liquid in the ratio 1 : 5 it does not matter if it is 1 mL to 5 mL or 1 L to 5 L.

We can also divide a quantity into a given ratio.

Consider: Split \$24 into the ratio 3 : 5

We begin by adding the 3 and 5 to get 8 parts.

Therefore the \$24 is to be split into $\frac{3}{8}$ and $\frac{5}{8}$.

So $\$24 \times \frac{3}{8} = \$9$

and $\$24 \times \frac{5}{8} = \$15$

One person receives \$9 and the other person \$15.

Ratios are meant to simplify problems, so we don't usually have any decimals in a ratio and the ratio is expressed in its simplest form.

Always check that the final quantities total the original amount.
In this case \$9 + \$15 = \$24.

Example

Simplify the ratios.

a) 18 : 30

b) 100mL : 3L Give your answer with the same units.

a) We identify the highest common factor of 6 and divide both 18 and 30 by 6.

18 : 30 = 3 : 5

Alternatively we can simplify using our calculator by entering the ratio as a fraction, i.e.

Casio 9750

1	8	a b/c	3	0	EXE

TI-84 Plus

1	8	÷	3	0	MATH	Frac 1

ENTER

Therefore 18 : 30 simplifies to 3 : 5

b) We convert to the same units (mL)

i.e. 100 : 3000.

We then divide by the highest common factor of 100 and 3000 which is 100 to get the simplified ratio 1 : 30.

Achievement – Simplify each ratio as much as possible. The final ratio should consist of whole numbers with the same units. Units should not be given as part of the answers.

226. 2 : 4

227. 0.5 : 8

228. 17 : 51

229. 18 : 27

230. 64 : 4

231. 200 : 500

232. 6 : 8 : 20

233. 12 : 27 : 9

234. 15 m : 25 m

235. 100 mL : 5 L

236. 0.5 m : 3 m

237. 8 : 12 : 20

238. 20 : 12 : 4 : 2

239. 50 g : 1.5 kg

240. 10 mm : 1 km

241. 450 kg : 1.5T

Find the unknown variable.

242. 2 : 7 = 10 : w

243. 4 : 0.5 = x : 18

244. 18 : 7 = 6 : y

245. 3 : 9 = 4 : z

Share each quantity in the given ratio.

246. Share \$32 in the ratio 3 : 5

247. Split 40 L in the ratio 15 : 5

248. Divide \$128 in the ratio 35 : 55

249. Divide 5 L in the ratio 19 : 1

250. Split 5.2 m in the ratio 3 : 6 : 4

251. Split \$35.80 in the ratio 5 : 3 : 8 : 4

252. Divide \$17.60 in the ratio 3 : 5

253. Divide \$143 in the ratio 6 : 5 : 2

254. Two students work after school to clear a building site. Alysia works a total of 15 hours and Barbara works 10 hours. They get paid \$240 in total. How much should each student get?

255. Three friends Clare, Dennis and Elliot contribute \$16 , \$12 and \$20 respectively towards the cost of an antique. They then sell the antique for a profit of \$80. How much profit should each friend get?

256. Two people enter into a partnership. One contributes \$20 000 and the other \$30 000. How should a profit of \$8500 be shared between them?

257. One person puts in \$2160 and another \$900 as part of an investment. How should a profit of \$680 from the investment be shared between them based on their contributions?

258. The price of a cinema ticket for a child compared to an adult can be represented by the ratio 4 : 5. If an adult pays $18.75 for a ticket what would a child pay?

259. A recipe has a ratio of water to milk of 3 : 2. If the recipe requires a total of 2.6 litres of liquid, how many litres of water is required?

260. A farmer has a 2 : 7 ratio of cows to sheep on his property. If he was to sell 42 sheep, how many cows would he have to sell to keep the same ratio?

261. A fertiliser comprises potash and super in the ratio 7 : 12. How much potash does 152 kg of fertiliser contain?

262. It is the first day of Deeana's holidays and she has a number of things to do prior to leaving on her Australian holiday. Use ratios to solve Deeana's problems.

a) Deeana needs to "shock dose" the swimming pool with chlorine. The container says that for a 9000 L pool she should add 200 g. What dose should she add for their 60 000 L pool?

b) Her neighbour has to add 1.5 kg of chlorine to their pool. How big a pool must she have?

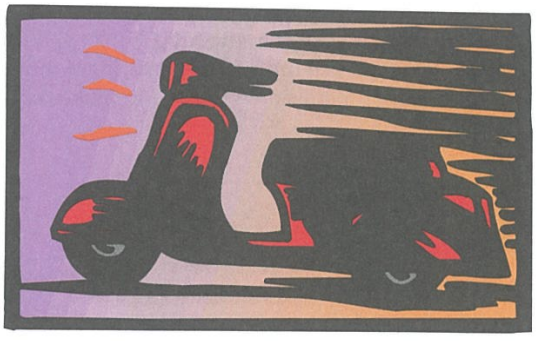
c) Deeana's friend Crystal has asked her to purchase some Australian clothes. The ratio of Australian money to New Zealand money is A $0.825 : NZ $1. How much Australian money will Crystal's NZ $300 equate to?

d) A fashion outfit cost A $185. How much is this in New Zealand dollars?

e) To get to Crystal's place Deeana uses her motorcycle. Her bike requires 50 mL of oil to be added for every 2 litres of petrol. How much oil should she add to 6.5 L of petrol?

f) The map of Auckland is at a scale of 10 mm for every 1 km of real distance. Deeana estimates that it is 7.5 cm to Crystal's place on the map. How far must she travel on her motorcycle?

g) Australia won 16 gold Olympic medals in 2000. The population of New Zealand was 3.8 million and that of Australia was 19.5 million. How many gold medals should NZ have won.



Example

A clothing store sells three different sizes of board shorts, S(mall), M(edium) and L(arge). They always purchase them in the ratio of 2 : 3 : 4. If the store purchases 18 M(edium) pairs of board shorts how many did they purchase altogether?

Let x = S size shorts and y = L size shorts.

$\frac{S}{M} = \frac{2}{3} = \frac{x}{18}$

so x = 12

i.e. 12 S(mall) pairs of shorts

and $\frac{M}{L} = \frac{3}{4} = \frac{18}{y}$

so 3y = 72

y = 24

i.e. 24 L(arge) pairs of shorts.

Total sold = 12 + 18 + 24 = 54 pairs of shorts

Example

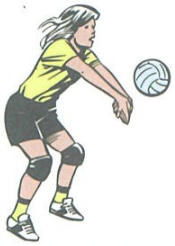
The total number of Year 9 students who sign up for volleyball is 57 and the ratio of girls to boys is 4 : 15. How many boys would have to choose another sport and leave volleyball for the ratio of girls to boys to be 4 : 11.

Number of boys who initially sign up for volleyball is $\frac{15}{19}$ x 57 = 45 boys, so there must be 12 girls.

The required ratio of girls to boys is 4 : 11,

so $\frac{11}{15}$ x 45 = 33, which is the number of boys required.

Hence 45 – 33 = 12 boys would need to choose another sport.



Merit/Excellence – Answer the following questions.

263. The ratio of three different coffees sold in a café are 2 : 4 : 5 (latté, cappuccino and flat white). If the café sells 48 cappuccino's in one day how many coffees did they sell in total?

264. The total number of people at a night class course is 54 and the ratio of men to women is 15 : 12. How many men would have to leave the course if the required men to women ratio had to be 5 : 6?

265. An alloy is composed of three metals, copper, tin and iron in the ratio 17 : 2 : 3. If the alloy contains 19 units of tin, how many units of the other metals are required to make the alloy?

266. The weight of dry ingredients in a recipe is 675 grams and the ratio of flour to sugar is 8 : 7. How much sugar would have to be added for the ratio to be 9 : 10?

Merit/Excellence – Answer the following questions.

267. A company's ratio of sales of three different types of calculators are 6 : 3 : 2 (scientific, graphic and algebraic). If the company sells 15 graphic calculators in one month how many scientific and algebraic calculators did they sell?

268. A company has a ratio of male to female employees of 15 : 11. Currently the company has 208 employees, but is offering voluntary redundancy to any male staff so that the ratio reduces to 12 : 11. How many male staff can accept voluntary redundancy?

269. The cost ratio in building a new house is 21 : 5 : 4 (construction : decor : landscaping). If the Smith's spend $112 500 on landscaping, and decor what is their construction costs and the total cost of the new house?

270. If the ratio 4 : x = x : 9, find the value of x.

271. If the ratio 25 : 4x = x : 4, find the value of x.

272. The cost ratio in printing a number of books is 4 : 2 : 1 (printing : paper : cover). If a publisher spends $45 000 on printing plus covers, how much would the paper component be and what is the total printing cost?

273. If the ratio 9 : 2x – 4 = 5 : x, find the value of x.

274. A company has a sales ratio of Workbooks to Homework Books of 11 : 8. Last year it sold 53 200 books in total. By how much would its Homework Book sales have to drop so its sale ratio became 77 : 50?

Page 19 cont...

190. $37.50

191. $17

192. 75.7% (1 dp)

193. 600 boys

194. a) $914.16

b) $68.56

c) $86.85

d) $83

Page 21

195. $258.30

196. 126.1

197. $41.56

198. $47.25

199. $110.98

200. $3499.13

201. 506 pupils

202. $649 900

203. 1544 or 1545

204. $19 125

Page 22

205. 31.4 % (1 dp)

206. 23.1 % (1 dp)

207. 10.7% (1 dp)

208. 20.8% (1 dp)

209. 38.0 % (1 dp)

210. 46.6% (1 dp)

211. $182.61

212. $430.43

213. $45

214. $2086.96

215. $168.18

216. $133.90

217. $476.86

218. 12.0% (1 dp)

Page 23

219. a) $314.50

b) $254.75

c) 11.3% (1 dp)

d) Receives $266.00 now so better off by $11.25

e) 77.6% (1 dp)

Page 23 cont...

220. a)

Commission – Company A	$210 000
Flat fee of $400	$400
4.5% of $100 000	$4500
2.5% of $110 000	$2750
Total (excluding GST)	$7650
Total (including GST of 15%)	$8797.50

b)

Commission – Company B	$210 000
Flat fee	$250
4% of $80 000	$3200
3.5% of $130 000	$4550
Total (excluding GST)	$8000
Total (including GST of 15%)	$9200

c) $402.50

d) 4.4% (1 dp)

Page 24

221. $7024.64

222. $23 534.07

223. 14.4% more (1 dp)

224. a) $30.52

b) $15.52

c) 103.5%

225. a) Option 1 = $7693.12
Option 2 = $8525
Option 2 better by $831.88

b) 10.8%

c) 11.3%

Page 26

226. 1 : 2

227. 1 : 16

228. 1 : 3

229. 2 : 3

230. 16 : 1

231. 2 : 5

232. 3 : 4 : 10

233. 4 : 9 : 3

234. 3 : 5

235. 1 : 50

236. 1 : 6

237. 2 : 3 : 5

238. 10 : 6 : 2 : 1

239. 1 : 30

240. 1 : 100 000

Page 26 cont...

241. 3 : 10

242. w = 35

243. x = 144

244. y = 2.33 (2 dp)

245. z = 12

246. $12, $20

247. 30 L, 10 L

248. $49.78, $78.22

249. 4.75 L , 0.25 L

250. 1.2 m, 2.4 m, 1.6 m

251. $8.95, $5.37, $14.32, $7.16

252. $6.60, $11.00

253. $66, $55, $22

254. Alysia = $144
Barbara = $96

255. Clare = $26.67
Dennis = $20
Elliot = $33.33

256. $3400 and $5100

257. $480 and $200

Page 27

258. $15

259. 1.56 litres

260. 12 cows

261. 56 kg

262. a) 1333 g (1.333 kg)

b) 67 500 L

c) $247.50

d) $224.24

e) 162.5 ml

f) 7.5 km

g) 3 gold medals.

Page 28

263. 24 + 48 + 60 = 132

264. 10 men

265. 161.5 units of copper and 28.5 units of iron

266. 85 grams

Page 29

267. 30 scientific and 10 algebraic calculators.

268. 24 males

269. Construction cost = $262 500
Total cost = $375 000

Page 29 cont...

270. $x = 6$

271. $x = 5$

272. Printing = \$36 000
Paper = \$18 000
Covers = \$9000
Total cost = \$63 000

273. $x = 20$

274. By 2400 books.

Page 31

275. 4.8 kg

276. 42 kg

277. 10 days

278. 20 days

279. 8 days

280. Uses an additional 300 L (1800 L in total).

Page 32

281. 4.2 ohms

282. 16 km/h

283. 22 500 baht

284. \$500

285. 104.2 cm (1 dp)

286. \$51.46

287. 2700 L

288. 1250

289. a) 33.3 g (1 dp)
b) 1 kg
c) 375 ml
d) 187.5 g

Page 33

290. 1.6 hours

291. An extra 12 tradesmen (27 in total)

292. For 33 days (33.3)

293. 11.7 minutes

294. 33.75 m

295. 7.5 minutes

296. \$778 000 (3 sf)

297. 63 cm

Page 35

298. a) 7.5 seams/minute
b) 337 or 338 seams (337.5)
c) 133.3 minutes (1 dp)

299. a) \$14.75 per hour
b) \$3156.50
c) 340 hours

300. a) 427.5 km
b) 26.39 m/s
c) 3.8 seconds (1 dp)

301. a) 18.7 minutes
b) 38.9 hours
c) 900 L/h

302. a) 25 kg/h
b) 23.3 kg/h

303. a) 0.354 cm/h
b) 23 days 13 hours

304. a) 12 days
b) 1.2 days
c) $\frac{12}{x}$ days

305. a) 7.5 hours
b) 4 hours
c) $\frac{60}{x}$ hours

Page 36

306. a) 12.5 days
b) 22.1 days

307. a) 2 days
b) 3.6 days
c) 15 people

308. a) 50 days
b) 65 days
c) 45 people

309. a) 0.75 m track/worker/day
b) 26.7 days
c) 100 workers

310. a) 200 seconds
b) 54 km/h
c) 63 km/h

311. 4.8 hours

312. 4.5 hours

Page 38

313. 25

314. 21

Page 38 cont...

315. 4

316. 64

317. 17

318. 60

319. 168

320. 168

321. 98

322. 540

323. 288

324. 24

325. 35

326. 177

327. $1\frac{1}{24}$

328. $\frac{1}{2}$

329. $\frac{17}{25}$

330. $\frac{27}{70}$

331. 2

332. $\frac{73}{120}$

333. 44

334. $^{-}27$

335. $\frac{2}{5}$ (0.4)

336. $2\frac{5}{14}$ (2.357 (3 dp))

337. $\frac{3}{20}$ (0.15)

338. $\frac{7}{9}$ (0.778 (3 dp))

339. $\frac{2}{3}$ (0.667 (3dp))

340. $\frac{^{-}1}{32}$ ($^{-}$0.03125)

341. $71 - 6 \times 8 + 7 \times (4 - 4) - 3$
$71 - 48 + 7 \times (0) - 3$
$71 - 48 + 0 - 3$
$= 20$

342. $9 + 3 - 16 + 5 \times 4 - 2$
$9 + 3 - 16 + 20 - (2)$
$12 - 16 + 20 - 2$
$^{-}4 + 20 - 2$
$16 - 2$
$= 14$

Page 40

343. $\frac{1}{8}$

344. $\frac{1}{25}$